

COLLABORATIVE FOR HIGH PERFORMANCE SCHOOLS

THE COLLABORATIVE FOR HIGH PERFORMANCE SCHOOLS (CHPS)

*TOOLS FOR THE NEXT GENERATION
OF CALIFORNIA SCHOOLS*

- The California school system is the largest in the country. One out of eight K–12 students in America goes to school in California.
- Nearly 6.2 million children, teachers, and administrators—one fifth of California’s population—spend their day inside a school.
- 100,000 new students enter the California school system every year.
- One-third of California’s K–12 students are housed in relocatables.
- One-third of California’s school facilities are in need of a major renovation.
- Schools spend \$450 million (nearly 3 percent of their total budgets) on energy. Between 20 and 40 percent (nearly \$150 million statewide) could be saved by increasing the energy efficiency of building designs.

“We are thrilled to be a part of this comprehensive effort that will contribute significantly to the quality of education in California,” said Waste Board Chair and CHPS Board Member Linda Moulton-Patterson. “As a former teacher, I realize how improved classroom design can impact every student’s ability to learn.”

“As more school districts adopt the CHPS Criteria, I look forward to an increase in student performance as a result of the enhanced classroom environments.”

California schools are facing multiple challenges: unprec-
edented student population
growth, demands for improved
student performance, constantly
tight budgets, and thousands of
school buildings in need of
repair.

To meet these demands, districts
will spend billions of dollars in
the upcoming years to build or
renovate hundreds of schools.
How these schools are designed
will affect the quality of the
building, decades of operational
expenses, and—most impor-
tantly—the health and produc-
tivity of generations of students
and staff.

High-performance school
buildings—those that incorpo-
rate the very best of today’s
design strategies and building
technologies—can simulta-
neously provide better learning
environments for our children,
cost less to operate, and help
protect the environment.

Organized in 2000, the Collabo-
rative for High Performance
Schools (CHPS) aims to increase
the performance of California
schools by providing informa-
tion, services, and incentive
programs directly to school
districts and designers. The goal
of the CHPS stakeholders is to

facilitate the design of high
performance schools: learning
environments that are energy-
efficient, healthy, comfortable,
well-lit, and contain the amenities
needed for a quality education.

CHPS can help school districts
and their design teams bring
better performance into the
classroom. With vision, determi-
nation, and knowledge, creating
such schools is possible now.



HIGH-PERFORMANCE SCHOOLS

Questions and Answers

High-performance schools are facilities that improve the learning environment while saving energy, resources, and money. So what's the catch? Aren't these designs prohibitively expensive and time-consuming? The answer is no. The key is understanding the lifetime value of high-performance schools and effectively managing priorities, time, and budget during the design and construction process.

- **How will high-performance schools help educate students?**

High-performance design can have a positive effect on health and comfort, and design strategies such as daylighting have been shown to enhance student learning. Good indoor air quality is essential for teacher and student health. Good design also produces more comfortable environments with proper lighting, air temperature, humidity, and noise levels. This reduces distractions and creates environments where students and teachers can see clearly, hear accurately, and not feel too warm or too cold.

- **Is high-performance design cost-effective?** Yes. High-performance design creates environments that are energy- and resource-efficient. These increased efficiencies save money on utility bills, and they are so valuable that some organizations will provide building owners with funds to have them included in the design. Furthermore, healthier environments can bring money *into* the school by lowering absenteeism

and increasing funding based on average daily attendance. These financial, health, and productivity benefits are the result of integrated design: understanding how building elements affect one another to optimize the performance of the entire school.

- **Do I have to choose between housing more students and high performance?** No. Because a school facility must be able to house as many students as possible, building high-performance schools at the expense of fewer classrooms is not an option. The key is to identify goals and budgets in advance and to verify that the designers and contractors explicitly understand your needs and their responsibilities. School construction budgets are tight, but cost-effective solutions can be found for nearly any budget.

- **Will I have the time to do this?** Yes. School design and construction timelines are short, but better design does not have to be a roadblock. As a district, you must identify your educational and high-performance goals early and communicate them clearly with the design team. Your goals can then be integrated into the design from an early stage, and not require time- and money-intensive changes later in the process. The CHPS

Criteria is a convenient and flexible system for identifying your high-performance goals.

- **Do I need to be an expert in high performance building design?** No. It's the role of the architect and the engineer to make sure the design is as effective as possible. You must, however, identify and prioritize your goals and hire designers with the appropriate skill sets. Without the luxuries of expansive timelines and budgets, every school design becomes a balanced system of trade-offs. Understanding the value of high-performance design will be important as choices arise.
- **Will high-performance schools demand extensive maintenance?** No. They do not require any more maintenance than traditional designs. High-performance design does not imply using overly-complicated, maintenance-intensive systems. It is a design philosophy that integrates daylight, electric lighting, air conditioning and ventilation systems, site planning, materials, and controls to create the best facility for your budget. All schools, from traditional to high-performance buildings, require regular maintenance to ensure they perform as designed. Health, comfort, and efficiency can all be compromised without adequate maintenance.

BENEFITS OF HIGH-PERFORMANCE SCHOOLS

High-performance schools have advantages from the local classroom to the district office, including:

Higher Test Scores. A growing number of studies are confirming the relationship between a school's physical condition—especially its lighting and indoor air quality—and student performance. One recent study of school districts in California, Washington, and Colorado indicates a strong correlation between increased daylighting and improved student performance. In the California district, for example, students in classrooms with the most daylighting progressed 20 percent faster on math tests and 26 percent faster on reading tests in one year than those in classrooms with the least amount of daylight. The message is clear, and it confirms what teachers, students, and parents have known anecdotally for years: a better facility—one with appropriate acoustics, lighting, indoor air quality, and other high performance features—will enhance learning and may improve test results.

Increased Average Daily Attendance (ADA). A high-performance school provides superior indoor air quality by controlling sources of contaminants, providing adequate ventilation, and preventing moisture accumulation. These tactics, designed to reduce sources of health problems and

inhibit the spread of airborne infections, help keep pollutants, stale air, and mold growth out of the classroom. The result will be fewer sick days for students and teachers, especially those suffering from asthma or other respiratory problems. The majority of a school's operating budget is directly dependent on ADA, so even a small increase can significantly boost the operating budget.

Reduced Operating Costs. High performance schools are specifically designed—using life-cycle cost methods—to minimize the long-term costs of facility ownership. By using less energy and water than standard schools, overall operating costs are lower—most notably in times of rising and uncertain energy prices. With good operation and maintenance, costs will remain lower for the life of the facility. School districts can save 20 to 40 percent on annual utility costs for new schools and 20 to 30 percent for renovated schools by applying high-performance design concepts. Savings can be used to supplement other budgets, such as maintenance, computers, books, special education, more classrooms, and salaries.

Increased Teacher Satisfaction and Retention. High-performance classrooms are designed to be pleasant and effective places to work. Visual and thermal comfort is high,

acoustics are good, and the indoor air is fresh and clean. Such environments become positive factors in recruiting and retaining teachers and in improving their overall satisfaction with their work.

Reduced Liability Exposure. Because they are healthy and emphasize superior indoor environmental quality, high-performance school buildings reduce a district's exposure to health-related problems, lawsuits, and loss of credibility. Remediation expenses for schools with indoor environmental problems often reach a quarter of a million dollars, and legal costs can be much higher. Consequently, proactive measures that prevent problems are good investments.

Reduced Environmental Impacts. High performance school buildings are consciously designed to have low environmental impact. They are energy- and water-efficient. They use durable, non-toxic materials that are high in recycled content, and the buildings themselves can be recycled. They preserve pristine natural areas on their sites and restore damaged ones. And they use non-polluting renewable energy to the greatest extent possible. As a consequence, high-performance school buildings are good environmental systems, and they are designed to stay that way for the entire life of the building.

WHAT IS A HIGH-PERFORMANCE SCHOOL?

“High-performance school” refers to the physical facility—the school building and its grounds. Creating one is not difficult, but it requires an integrated “whole building” approach to the design process. Key systems and technologies must be considered together—from the beginning of the design process—and optimized based on their combined impact on the comfort and productivity of students and teachers.

A high-performance school is:

- **Healthy.** Good indoor air quality is essential. It requires minimizing pollutant sources and providing adequate ventilation and air filtration. The significant amount of time that students and teachers spend inside schools during their educational career, combined with children’s increased susceptibility to indoor pollutants, underscores the importance of healthy indoor environmental quality.
- **Thermally, Visually, and Acoustically Comfortable.** Thermal comfort means that teachers, students, and administrators should be neither hot nor cold as they teach, learn, and work. Visual comfort means that

quality lighting makes visual tasks, such as reading and following classroom presentations, easier. The lighting for each room is “designed,” not simply specified. Daylight and electric lights are integrated, and glare is minimized. Visual comfort also means providing a connection to the outdoors and visual stimulation through the use of windows at eye level to offer views. Acoustic comfort means teachers and students can hear one another easily. Noisy ventilation systems are eliminated, and the design minimizes the amount of disruptive outdoor and indoor noise affecting the classroom.

- **Energy-Efficient.** Energy-efficient schools save money while conserving non-renewable energy resources and reducing atmospheric emissions of pollutants and greenhouse gases. Heating, ventilating, and air-conditioning (HVAC) systems use high-efficiency equipment, are “right-sized” for the estimated demands of the facility, and include controls that optimize system performance. The school’s lighting system uses high-efficiency

products, optimizes the number of light fixtures in each room, incorporates control devices that ensure peak system performance; and successfully integrates electric lighting and daylighting strategies. The walls, floors, roofs, and windows of the school are as energy-efficient and cost-effective as possible. The building shell integrates and optimizes insulation levels, glazing, shading, thermal mass, air leakage, and light-colored exterior surfaces to minimize the use of the HVAC systems.

- **Material Efficient.** To the maximum extent possible, the school incorporates building materials that have been produced in a way that conserves raw materials. Such materials may be manufactured with recycled content and rapidly renewable resource, are durable, can be recycled or reused. In addition, the school has been designed and built in a manner that reduces waste and keeps reusable or recyclable materials out of the landfill.

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- **Water Efficient.** Water scarcity is a major problem in much of California. High-performance schools are designed to use water efficiently, saving money while reducing the depletion of aquifers and river systems and minimizing the use of sewage treatment systems. The school uses as little off-site water as possible to meet its needs, controls and reduces water runoff from its site, and consumes fresh water as efficiently as possible.
- **Easy to Maintain and Operate.** Building systems are simple and easy to use and maintain. Teachers have control over the temperature, airflow, acoustics, and lighting in their classrooms, and they are trained on how to most effectively use them.
- **Commissioned.** The school operates the way it was designed and meets the district's needs. This happens through a formal commissioning process—a form of “systems check” for the facility. The process includes testing, verification, and fine-tuning the performance of key building systems so that they perform at the highest levels of efficiency and comfort. Finally, the staff receives training to properly operate and maintain the systems.
- **An Environmentally Responsive Site.** The site is recognized as an essential element of the school building's high-performance features. To the extent possible, the school's site conserves existing natural areas and restores damaged ones; minimizes stormwater runoff and controls erosion; and incorporates products and techniques that do not introduce pollutants or degradation to the project site or at the site of extraction, harvest, or production.
- **A Teaching Tool.** By incorporating important concepts such as energy, water, and material efficiency, schools can become tools to illustrate a wide spectrum of scientific, mathematical, and social issues. HVAC and lighting equipment and controls systems can be used to illustrate lessons on energy use and conservation, and daylighting systems can help students understand the daily and yearly movements of the sun.
- **Safe and Secure.** High performance does not compromise safety. Students and teachers feel safe anywhere in the building or on the grounds. Design primarily creates a secure environment, optimizing opportunities for natural surveillance, reinforcing a sense of community, and controlling access. Security technology enhances, rather than substitutes for, the design features.
- **A Community Resource.** The most successful schools have a high level of parent and community involvement. This involvement can be enhanced if schools are designed for neighborhood meetings and other community functions.
- **Stimulating Architecture.** High-performance schools should invoke a sense of pride and be considered a genuine asset for the community.

Visit www.chps.net/ for further details.

CHPS SELF-CERTIFICATION

School districts can self-certify that they have achieved “high performance” status and become a CHPS school, by using the eligibility criteria described under the CHPS Best Practices Manual. Please see next page.



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ELIGIBILITY CRITERIA

The CHPS Criteria explicitly defines a high-performance school through performance standards and design criteria. The system provides a convenient means of identifying and requesting a high performance school, while remaining flexible to give districts and designers the freedom to create a facility that fits their budget, timeline, and educational goals.

Best Practices Manual

The manual is set to become a standard reference for high-performance school design in California. The manual (available in print, CD-ROM, or on the Web) is split into four volumes:

Volume I Planning is directed towards school districts and includes detailed information on the advantages, process, and budgeting issues associated with designing high performance schools. A process guide details the questions that districts should ask their design teams.

Volume II Design is a set of technical design guidelines written for designers and project managers. It contains information on each building system and provides a variety of detailed design recommendations centered on resource efficiency, daylighting, and indoor air quality. It is intended to be a

flexible and complete resource for architects and engineers by including a discussion of application, cost-effectiveness, maintenance, commissioning, and integrated design issues.

Volume III Criteria is the high performance school flexible points system eligibility criteria discussed above, that defines a high-performance “CHPS school.” School districts can use the criteria to simply and clearly communicate their design goals. In addition, the flexibility of the system allows designers to deliver a “CHPS school” while managing the regional, district, and site-specific constraints of the design.

Volume IV Maintenance and Operation discusses operation and maintenance strategies for keeping high-performance schools running at optimum efficiency levels. Improper use of building systems and poor maintenance practices can greatly diminish the energy and cost-savings of a high-performance school. Written for maintenance staff, teachers, and faculty managers, the topics covered in this manual include cleaning and calibrating building systems, selecting cleaning products, and promoting waste reduction. (Available in 2003)

CHPS BEST PRACTICES

MANUAL

Training Programs

Interested in learning more? Informational presentations and training programs are available for school districts and design firms. These programs can be tailored to suit your needs and time constraints. Call 1-877-642-CHPS for more information.

Financial Incentive and Technical Assistance Programs

Several programs are currently available to financially and technically assist districts and designers in creating high-performance schools.

The Savings by Design program promotes energy-efficient design in new construction and renovation projects with financial incentives and technical resources for designers, contractors, and building owners.

California Energy Commission's Bright Schools Program offers a full suite of programs to schools considering high-performance design strategies in new and existing buildings.

Standard Performance Contracting
Under this program, Energy Efficiency Service Providers (EESP) provide information and energy audit services to analyze energy saving opportunities in existing school buildings.

Energy Design Resources is a program to develop and disseminate design tools and resources that help elevate energy efficiency in new schools to a higher priority.

Contact CHPS directly for more information. www.chps.net

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CIWMB SPONSORS FIRST MATERIAL SHOWCASE DEMONSTRATION SCHOOL

As part of the CHPS stakeholders effort to build a network of high-performance demonstration schools, CIWMB awarded \$200,000 to Santa Ana Unified School District for Lorin Griset Elementary School. This project will become the first high performance demonstration school that showcases material-efficient design and construction. Two main goals include:

- diverting 75 percent of the construction waste from the landfill and
- incorporating recycled-content building products into the project.

Energy-efficient features such as daylighting and an energy management system for the heating ventilation and air conditioning (HVAC) and lighting systems will allow the school to exceed California's Title 24 Energy Code by at least 20 percent.

The high performance design of Griset Elementary School supports the district's educational programs such as Project Above the Mean (ATM), meet the challenges many minority and inner city youth face.

Anticipated enrollment of Lorin Griset is 850 students. The school is expected to open in mid-2004.

IMPROVING INDOOR AIR QUALITY

The CIWMB recently approved a \$130,000 contract for building materials emissions testing for classrooms and State construction. The contract will enhance markets for environmentally preferable recycled-content building products. Both standard and alternative products, with an emphasis on recycled-content products, are currently being tested to ensure that they are healthy building products.

CHPS has adopted a *Special Environmental Requirements Specification*, Section 01350, which is the building materials emissions testing protocol used for this study. This landmark emissions testing procedure is nationally recognized for its unique requirements. The testing procedure evaluates emissions levels from a list of individual chemicals of concern, instead of relying on the typical total volatile organic compounds (TVOC) analysis conducted by industry. The ultimate goal of the project is to improve indoor environmental conditions in California classrooms and State facilities.

LOS ANGELES UNIFIED SCHOOL DISTRICT TAKES LEADERSHIP ROLE

During the next 6 years, LAUSD plans to build 139 new facilities to accommodate their growing student population and in the process spend some 2.8 billion dollars.

In a resounding endorsement of the importance of sustainability for these future schools, the LAUSD Board of Education approved a resolution that makes the district the first in the state to adopt the CHPS sustainable design criteria. Subsequently, the district has developed a scorecard, which requires project managers and architects to certify that all LAUSD projects qualify as "CHPS schools." One specific requirement is that each project diverts 75 percent of its construction and demolition waste from the landfill. Additionally, CIWMB staff is assisting the District to incorporate recycled-content products into their schools. This groundbreaking commitment by LAUSD will be a model for future schools and districts.



Putting It All Together

The knowledge and technical resources to build high-performance schools already exist. Your district can build sustainable schools if you demand them. You will need to plan early, know what to ask for, and verify that the design firms you hire have the required knowledge and skills.

Whether building a new school or renovating an existing structure, there are five key elements to creating a high-performance school.

- **Set Goals.** Develop your high-performance goals early. The benefits of high performance schools are achievable only when districts establish their goals from the beginning and fight for them over the course of the development process. The CHPS eligibility criteria provides a flexible way to set goals. This point system covers the essential elements of high-performance design and can be used by districts to clearly identify their priorities. A focus on student and teacher performance—coupled with a concern for the environment and a commitment to cost-effectiveness—will help ensure that the effort is successful and that any school—no matter what its budget—achieves the highest performance level possible for its particular circumstances.

- **Communicate Goals to Designers.** Include these goals in the educational specifications and designer request for proposals to communicate early your design intentions. Choose a design team with the skills to make your goals a reality.

- **Pursue Integrated Design.** Insist on the development of an integrated design team to take full benefit of design options that affect the entire building performance.

- **Monitor Construction.** Communicate goals to the contractors, and be wary of substitutions or design changes during construction that might occur without consulting the designer.

- **Verify Goals.** Commission the building to prove that you are getting what you paid for, and that the building has been built as designed, and designed to your specifications.

To learn more:

Visit the CHPS Web site at www.chps.net.

Call your local CHPS representative or 1-877-642-CHPS.

Set up an introductory presentation or technical discussion for your local district or design firm. Call or write for more details and availability.

In November 1999, the California Energy Commission called together Pacific Gas and Electric Company, San Diego Gas and Electric, and Southern California Edison to discuss the best way to improve the performance of California's schools. CHPS was formed out of this partnership and has grown to include a diverse range of government, utility, and nonprofit organizations with a unifying goal: to improve the quality of education for California's children.

CHPS Board Members:

California Department of Education (CDE)

Division of the State Architect (DSA)
Office for Public School Construction (OPSC)

California Energy Commission (CEC)
California Integrated Waste Management Board (CIWMB)

Los Angeles Department of Water and Power (LADWP)

Pacific Gas and Electric Company (PG&E)

Sacramento Municipal Utility District (SMUD)

San Diego Gas and Electric (SDG&E)
Southern California Edison (SCE)
Southern California Gas Company (SoCalGas)

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